



# Advisory Circular

DRAFT

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**Subject:** FLAMMABILITY TESTING  
OF AIRCRAFT CABIN INTERIOR  
PANELS!

**Date:!**  
**Initiated by:** AIR-100

**AC No:** 20-XXX

## 1. PURPOSE.

**a.** This advisory circular (AC) describes methods to gain approval of new aircraft cabin interior materials to use on existing aircraft interior wall and ceiling panels, and on other components. This includes finishes or decorative surfaces. Apply this AC to materials that must be self-extinguishing only, and not to materials that must meet heat release or smoke emissions standards. We have written this AC for applicants, offering you several methods for demonstrating compliance, which may be cost-effective and less time-consuming than current methods.

**b.** This AC is not mandatory and does not constitute a regulation. It describes an acceptable means, but is not the only means, for you to gain approval for your materials. However, if you use the means we describe, you must follow them in all important respects.

**2. PROBLEMS WITH PANEL TESTING.** Refurbishing cabin interiors of existing airplanes often includes replacing the material on wall or ceiling panels, or both. The refurbished panels must be tested and pass flammability requirements listed in paragraph 3 of this AC. When spare panels are not available for flammability testing and the panel is no longer in production, the only source for panels is from the aircraft itself. This requires you to cut sections out of the panels for testing, which may be a hardship.

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**3. CURRENT PUBLICATIONS AND WHAT THEY COVER.** See Table 1 below:

TABLE 1. CURRENT PUBLICATIONS

<i>Regulation</i>	<i>What is covered</i>
14 CFR §§ 23.853(d)(3)(i), 25.853(a), 29.853(a)(1)	Current regulations on flammability of self-extinguishing materials in aircraft cabin interiors
14 CFR part 23 Appendix F	Specific procedures for testing self-extinguishing materials used in cabin interior panels in commuter category airplanes
14 CFR part 25 Appendix F, Part I, (a)(1)(i)	Specific flammability requirements and testing procedures for self-extinguishing materials used in cabin interior panels in transport airplanes and transport rotorcraft
14 CFR part 23, Appendix F (b)	Test specimen configuration - “materials must be tested either as a section cut from a fabricated part as installed in the aircraft or as a specimen simulating a cut section”
14 CFR part 25, Appendix F Part I (b)(2)	Same as above

**4. TESTING - IMPORTANCE AND PROBLEMS.** FAA fire tests have shown that the flammability characteristics of large surface area panels have a big effect on cabin fire safety.

a. Flammability certification rules specify that you test the panel and finish or decorative surface material together as a unit specimen, to account for any synergistic effects among the panel components when exposed to fire. Some applicants find that test specimens of original panel materials are difficult to obtain. They are either unable to get the specifications they need to produce the panel material from the airplane manufacturer, or the materials are no longer being produced. Applicants end up either sacrificing serviceable panels for specimens, or using alternate materials to demonstrate equivalent levels of safety.

b. There can be significant problems with using alternate materials, because of the unknown flammability behavior of untested combinations of materials.

c. Applicants say that flammability testing, using new burn-resistant overlay replacement material on old panels, is counter-productive because the flammability characteristics of the new materials are superior to those of the old/original material. New materials have a higher probability of meeting the burn test requirements than the old material. This may be valid, but until the specimen availability problem is solved, the primary means of assuring safety for all applications is by either testing a panel and overlay from the airplane, or testing an old panel with the new material.

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## 5. USING SURROGATE PANELS FOR FLAMMABILITY TESTING.

a. The International Aircraft Materials Fire Test working group and the FAA Technical Center investigated whether a similar but nonidentical panel, known as a surrogate panel, may be used in place of original base panel materials for flammability testing of renovated aircraft interiors. The investigation report, DOT/FAA/AR-TN01/112, *Heat Release and Flammability Testing of Surrogate Panels*, dated December 2001, documented the measured heat release rates and vertical burn lengths generated by panels constructed to the same standard by three different manufacturers. The report also documented the complex behavior of theoretically identical panels when burned. The report concluded: "...it would be very difficult to adopt a standardized procedure in which renovated interiors could be certified using surrogate materials." The conclusion was based primarily on the results of the heat release rate tests. (View the report at [www.fire.tc.faa.gov/reports/reports.asp](http://www.fire.tc.faa.gov/reports/reports.asp).)

b. Although the FAA Technical Center staff demonstrated the difficulty of producing surrogate materials identical to the original materials for flammability testing, they did develop a method to account for the variability in producing identical materials. This method will allow applicants to have new finishes on old panels approved after they test the new finish on a suitable surrogate panel. The old panels are the panels that were approved under the aircraft's original type design.

c. Before testing the surrogate panel with the new finish, test the surrogate panel without the new finish to show it provides a conservative test basis when compared to the original panel. As an example, when the aircraft interior panels are required to be self-extinguishing, a surrogate panel without the new finish is tested that must show a longer, or worse, vertical burn length than the original panel. You can then test the surrogate panel with the new finish to determine the vertical burn length. This ensures that uncertainties and variability in the burn characteristics between the original panel and the surrogate panel are compensated for in the test to certify the original panel with its new finish.

d. All surrogate panels should, as far as possible, represent the interior component to be modified, including:

- Core type,
- Resin type,
- Thickness and number and type of pre-preg plies, and
- All finishes such as paint, wood veneers, appliques, or other decorative coverings.

e. We expect you to determine the basic construction (for example, honeycomb versus closed-cell foam core, number of panel layers, thickness of each layer, wood veneer versus appliqué) of the original. This will help you to fabricate a surrogate panel of similar construction. We know it will not be possible in every case to determine the exact identity of

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each material (such as core brand, resin brand, veneer or appliqué brand) used in the original panel. We will accept your using the same material “type” that approximates the original material.

**f.** For example, if the original panel is constructed with a cherry wood veneer finish that will be used again (after sanding and refinishing) it is reasonable and acceptable to construct a surrogate panel with a cherry wood veneer of the same thickness. We don’t require you to determine the detailed composition of the veneer, like the number of plies, grain orientation, or sub-species of cherry wood.

**(1)** When original panels are available (without destructive testing of installed components), then you cannot use a surrogate panel to demonstrate compliance to the flammability requirements.

**(2)** The test methodology in Table 2 lets an applicant use certain surrogate panels for certifying renovations and alterations of aircraft interiors. Table 2, Option 3 specifies the vertical burn lengths the surrogate panels must show based on the values of the originally approved panels.

**(3)** The surrogate panel with the new finish must comply with the applicable flammability requirements after testing.

**TABLE 2. METHODS FOR TESTING VERTICAL BURN LENGTH OF NEW FINISHES  
ON OLD PANELS**

Option 1	Use flat panel spares supplied by the aircraft manufacturer, or	
Option 2	Use a panel cut out from the aircraft to be modified, or	
Option 3	If original approved data for the component to be modified demonstrates the 60-second vertical Bunsen burner test burn length is	Fabricate and use a surrogate panel with a burn length no less than
	Less than or equal to 1 inch	1.5 inches
	More than 1 inch and less than or equal to 2 inches	2.5 inches
	More than 2 inches and less than or equal to 3 inches	3.5 inches
	More than 3 inches and less than or equal to 4 inches	4.5 inches
	More than 4 inches and less than or equal to 6 inches	5.5 inches
Option 4	If original data does not exist for the 60-second vertical Bunsen burner test, use a surrogate panel with a burn length no less than 5.5 inches, OR	
Option 5	If original data does not exist for the 60-second vertical Bunsen burner test, develop new data from panel cut from the aircraft. Use a surrogate panel with a burn length as specified in Option 3.	

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## 6. SOME QUESTIONS AND ANSWERS ON APPLYING THIS GUIDANCE.

**Q1.** If I have approved data for my existing panel that shows a vertical burn length of less than 1.0 inch, why do I use a surrogate panel with a burn length of *not less* than 1.5 inches?

**A1.** Using a surrogate panel with a minimum burn length establishes a conservative basis for qualifying the new finish. The difference between the approved data burn length of the original panel and the burn length of the surrogate panel, in this case at least 1.5 inches, establishes an acceptable margin to account for the uncertainties in using a surrogate panel.

**Q2.** Can the surrogate panel have a vertical burn length that exceeds the criteria in Table 2 of this AC?

**A2.** Yes. But when it is burned, the surrogate panel with the new finish must meet all of the minimum requirements established by the appropriate test method prescribed in the CFR.

**Q3.** If I have approved data that shows the burn length of the original panel and finish was 2.3 inches, what's the vertical burn length that must be demonstrated with the surrogate panel and new finish?

**A3.** The maximum allowable vertical burn length is dictated by the applicable flammability requirements for the aircraft type regardless of the burn length of the approved original panel. For commuter category airplanes, transport category airplanes, and rotorcraft, the maximum allowable vertical burn length is not to exceed 6 inches.

**Q4.** What can I do if I can't obtain the original approved burn data and can't get spare panels?

**A4.** You can do any of three things:

1. Cut coupons from the original panels in the aircraft for each burn test per Table 2, Option 2, or

2. Avoid cutting panels from the aircraft by using a surrogate panel with a burn length of at least 5.5 inches per Table 2, Option 4, or

3. Generate the data from a panel cut from the aircraft per Table 2, Option 5. After the new data is generated, you can use Option 3 to determine the requirements for the surrogate panel. The benefit of Option 5 is that only a single vertical burn test will have to be done with panel material cut from the aircraft to establish the burn length. You can then use the surrogate panel to validate multiple finishes for the same aircraft or for other aircraft having the same original panels. This will reduce the number of test specimens that will have to be cut from the aircraft. It may also be easier to develop or find a surrogate panel with a minimum burn length above the newly generated data (per Option 3) than to default to the surrogate panel burn length of 5.5" specified in Option 4.

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**Q5.** Since it takes only a single burn test to determine the burn length from the panel material cut from the aircraft, how many test specimens do I have to burn: one or three?

**A5.** Three. When generating new data from panels in the aircraft, from spare panels, and for surrogate panels, the tests must be done per the applicable regulations. 14 CFR Part 25 Appendix F requires you to burn a minimum of three specimens and average the results to establish the vertical burn rate for the tested material. But once you generate the data from specimens cut from the aircraft, you can use the approved data to certify other finishes as explained in A4.c. above.

**7. WHO DETERMINES ELOS.** The directorate accountable for the standards of the aircraft's certification basis determines an equivalent level of safety (ELOS) to meet flammability requirements. Directorate staff should follow policy memo *Public Involvement in Policy and Guidance Developed by Aircraft Certification Directorate Standards Staffs, SMT01-01* issued March 27, 2001. You can find document (PS-ANM100-2001-00060) at the following FAA website: [http://www.airweb.faa.gov/Regulatory\\_and\\_Guidance\\_Library/rgPolicy.nsf/](http://www.airweb.faa.gov/Regulatory_and_Guidance_Library/rgPolicy.nsf/)

**8. WHAT TO DO IF YOU DEVIATE.** We don't regard this guidance as compulsory, but it does show you a means of demonstrating compliance with the applicable regulations.

**a.** If you deviate from this guidance, the deviance has to be resolved through issue papers. The responsible ACO will coordinate all issue papers with the accountable directorate and Aircraft Engineering Division, AIR-100, to ensure that our policy application is standard.

**b.** You should expect certifying officials to consider these issue papers when making findings of compliance in new certificate actions.

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